

The Journal of the American Association of Zoo Keepers, Inc.

Animal Keepers' Forum



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ABOUT THE COVER

This month's cover photo comes to us from the Cincinnati Zoo. It features an African Painted Dog (*Lycaon pictus*). Once known as African wild dogs, painted wolves, and cape hunting dogs, painted dogs get their name from their incredible coats – interestingly, each as unique as a fingerprint. In fact, researchers believe that color patterns allow pack members to recognize each other from distances up to 100 meters away. These long-legged canines have only four toes per foot, unlike other dogs, which have five toes on their forefeet. The dog's Latin name means "painted wolf," referring to the animal's irregular, mottled coat, which features patches of red, black, brown, white, and yellow fur. Each animal has its own unique coat pattern, and all have big, rounded ears.

African Painted Dogs are listed as an endangered species. The biggest threats to painted dogs come from humans. The painted dogs are injured and killed in snares, road kills and expanding human settlement reduces suitable habitat for them and their prey. They are also susceptible to diseases such as rabies and distemper from domestic dogs. Human ignorance and misinformation is perhaps one of the biggest issues facing the painted dog population. Local landowners believe them to be dangerous, numerous, wanton and indiscriminate pack hunters, and thus best removed from their land.

Articles sent to **Animal Keepers' Forum** will be reviewed by the editorial staff for publication. Articles of a research or technical nature will be submitted to one or more of the zoo professionals who serve as referees for **AKF**. No commitment is made to the author, but an effort will be made to publish articles as soon as possible. Lengthy articles may be separated into monthly installments at the discretion of the Editor. The Editor reserves the right to edit material without consultation unless approval is requested in writing by the author. Materials submitted will not be returned unless accompanied by a stamped, self-addressed, appropriately-sized envelope. Telephone, fax or e-mail contributions of late-breaking news or last-minute insertions are accepted as space allows. Phone (330) 483-1104; FAX (330) 483-1444; e-mail is shane.good@aaazk.org. If you have questions about submission guidelines, please contact the Editor. Submission guidelines are also found at: aaazk.org/akf-submission-guidelines/.

Deadline for each regular issue is the 3rd of the preceding month. Dedicated issues may have separate deadline dates and will be noted by the Editor.

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ANIMAL KEEPERS' FORUM

TO CONTACT THE AKF EDITOR:

Shane Good, AKF Editor
P.O. Box 535, Valley City, OH 44280
330-483-1104
Shane.Good@aaazk.org

AAZK Administrative Office

American Association of Zoo Keepers
8476 E. Speedway Blvd. Suite 204
Tucson, AZ 85710-1728
520-298-9688 (Phone/Fax)

CHIEF EXECUTIVE/FINANCIAL OFFICER: Ed Hansen
E-mail: Ed.Hansen@aaazk.org

ANIMAL KEEPERS' FORUM - EDITOR

Shane Good, Shane.Good@aaazk.org

GRAPHIC DESIGNER

Elizabeth Thibodeaux, Elizabeth.Thibodeaux@aaazk.org

ENRICHMENT OPTIONS COLUMN COORDINATORS

Stephanie Miner, Julie Hartell-DeNardo,

Beth Stark-Posta, Beth Ament-Briggs

TRAINING TALES COLUMN COORDINATORS

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Stephanie Miner, Julie Hartell-DeNardo,

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Program Manager: Kym Janke, Kym.Janke@aaazk.org

Vice Manager: Vacant

Trees for You and Me Program

Program Manager: Christy Mazrimas-Ott, Christy.Mazrimas-Ott@aaazk.org

Vice Manager: Anthony Nielsen, Anthony.Nielsen@aaazk.org

BOARD OVERSIGHT: Bethany Bingham, Bethany.Bingham@aaazk.org

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AAZK celebrates the 12th anniversary of National Zoo Keeper Week!

Congratulations to all animal keepers as AAZK celebrates the 12th anniversary of National Zoo Keeper Week. Over the years much discussion within AAZK and our partner institutions has occurred regarding exactly what National Zoo Keeper Week is and what NZKW means within our profession. Passed by the 110th United States Congress (House Resolution 509) on June 21, 2007, I offer the following proclamations and resolution from the document:

Whereas zoo keepers are vital advocates for conservation, participating in the fight for species survival and preservation of the natural homelands of the animals they care for through public awareness, education, and exhibition; and

Whereas zoo keepers have committed their lives to ongoing professional development and training in becoming animal specialists, educators, choreographers of animal behaviors through enrichment, behavior managers through operant conditioning, and reproductive specialists through improved observations and husbandry; and

Whereas to help increase public awareness about the need to preserve precious habitats and the animals which inhabit them and to recognize the invaluable roles that zoo keepers play in animal conservation and education:

Now, therefore, be it known...

The House of Representatives recognizes the valuable contribution zoo keepers make to the care and conservation of captive exotic animals as well as their important contributions to research, public education, and recreation.

The words above are reinforced annually by member action. AAZK Chapters have a powerful voice in global conservation.

In 2017, AAZK Chapters contributed almost 1 million dollars (\$930,940.74 to be exact) to deserving groups and charities around the globe. AAZK Chapters made 489 individual donations to 357 different non-profit or charity organizations around the world. AAZK Bowling for Rhinos, AAZK Trees for You and Me, AZA Disaster Relief efforts and AZA SAFE – Vaquita were the major benefactors of the hard work and dedication of AAZK Chapters last year. The work continues in 2018.

NZKW is about acknowledgement of value.

Thank you for everything you do for conservation every day. AAZK would not be AAZK with you.

A handwritten signature in green ink, which appears to read "Ed Hansen". The signature is stylized with loops and is written on a white background.

Ed Hansen

AAZK Chapters – A Conservation Force

Ed Hansen, AAZK CEO/CFO

The following information was compiled from the AAZK Chapter Re-charter materials submitted in 2018 and details the conservation spending by AAZK Chapters in 2017.

On January 1, 2018 AAZK had 111 duly chartered Chapters within the Association, with Chapter membership totaling 2363 individuals. Ninety-six of those AAZK Chapters made contributions to fellow non-profit conservation organizations or registered charities during 2017.

Last year, AAZK Chapters contributed almost 1 million dollars (**\$930,940.74 to be exact**) to deserving groups and charities around the globe. The average donation to conservation and charity totaled **\$9697.30** per AAZK Chapter. AAZK Chapters made **489** individual donations to **357** different non-profit or charity organizations around the world.

The primary beneficiary of the generous contributions to conservation from AAZK Chapters benefit our internal conservation projects, Bowling for Rhinos and Trees for You and Me. AAZK Chapters raised and donated over ½ million dollars (**\$561,539.03**) for species and habitat conservation in Asia and Africa and funded two grants in conservation, the BFR Conservation Resource Grant (**\$13,143.15**) and the Trees for You and Me Restoration Grant (**\$18,364.45**). In addition to these two grants, AAZK endows other Continuing Education, Conservation and Research Grants totaling over **\$40,000** annually for members and non-members.

After supporting AAZK Conservation and our Conservation Partners, AAZK Chapters donated **\$356,258.56** to **258** conservation projects, emergency relief, or other charitable ventures, the biggest recipient of AAZK Chapter efforts being AZA Disaster Relief and AZA SAFE (Vaquita). Also included are **27 AAZK Chapters** who donated back to their Host Facilities' support entities to support projects, scholarships or research within their facility or to deserving conservation projects spearheaded by other zoo or aquarium facilities.

I am often asked by zoo and aquarium directors and managers regarding the concept and purpose of AAZK Chapters. The Mission of AAZK and our Chapters is straightforward:

The American Association of Zoo Keepers exists to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life.

Thank you once again to all of the AAZK Chapters and members who work so very hard day in and day out to reinforce the Mission and Vision of AAZK and who contribute to global conservation.



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2018 Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles

Fort Worth, TX

For more information go to:
turtlesurvival.org/conference#.
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August 23-25, 2018

International Symposium on Pangolin Care and Conservation

Brookfield, IL

Hosted by Chicago Zoological Society
For more information contact:
amy.roberts@czs.org

August 26-29, 2018

Association of Zoo Veterinary Technicians

Columbus, OH

Hosted by Columbus Zoo and Aquarium

For more information go to:
azvt.org

September 17-28, 2018

Smithsonian-Mason School of Conservation. Ecology and Conservation of Migrating Birds

Front Royal, VA

For more information go to:
smconservation.gmu.edu

September 23-27, 2018

AZA Annual Conference

Seattle, WA

Hosted by Seattle Aquarium and Woodland Park Zoo
For more information go to:
aza.org/conferences-meetings#mym

October 8-12, 2018

From Good Care to Great Welfare

Detroit, MI

Hosted by The Detroit Zoological Society's Center for Zoo and Aquarium Animal Welfare and Ethics
For more information go to:
www.czaw.org/events

October 14-18, 2018

International Congress on Zookeeping

Buenos Aires, Argentina

Hosted by Fundacion

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For more information go to:
iczoo.org/congress

October 15-20, 2018

Otter Keeper Workshop

Portland, OR

Hosted by Oregon Zoo
For more information go to:
otterkeeperworkshop.org/

October 25-27, 2018

Waterfowl Conservation Workshop

Greenville, NC

Hosted by International Wild Waterfowl Association and Sylvan Heights Bird Park
For more information go to:
waterfowlconservation.org



October 4-8, 2018

AAZK National Conference
Denver, CO

Hosted by the Rocky Mountain AAZK Chapter and Denver Zoo

rmaazk.org/2018-national-aazk-conference/

November 5-7, 2018

Canid and Hyenid Husbandry Course

St. Louis, MO

Hosted by the St. Louis Zoo and the Endangered Wolf Center

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Ladies and Gentlemen, may we introduce the Rope Refuge!

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Please excuse the initial picture. As you might guess, this is our first prototype and we are really looking forward to getting some real honest-to-goodness “action” shots from you guys. Anyone open to getting us some high-quality pictures of it being used? We also need professional feedback. Let’s make a deal!

This particular Rope Refuge (pictured) is constructed with (6) 12” Heavy Duty Food-Grade Polyethylene Balls. Each Ball has a corrosion-resistant perch / climbing handle and are held together with 1” diameter brown Pro-Manila Rope. These do not smell. The Balls can be site-adjusted without tools to any position on the rope.

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Should We Design Exhibits for Optimal Zoo Behavior or Wild Behavior?

Lessons Learned from Informal Conversations and Observations of Zoo Orangutans

Shelly Donohue, Primate Keeper
Cincinnati Zoo & Botanical Garden
Cincinnati, Ohio

Introduction

As zoos have transitioned from small “hard” enclosures to naturalistic exhibits, much has been learned about providing appropriate environments and enrichment to enable zoo animals to elicit species-typical behaviors and increase their well-being (Moss, Esson, and Francis, 2010; Rabb, 2004; Robinson, 1998; Shepherdson, Mellen, and Hutchins, 2010; Shettel-Neuber, 1988; Sommer, 1974). A critical part of this includes providing the appropriate levels of social, cognitive, and physical stimulation (Herbert and Bard, 2000). Some of the ways zoos provide these crucial elements come in the form of species-specific enrichment

devices, providing opportunities for perceived control, operant conditioning, adequate enclosure size with appropriate vertical and horizontal space, and environmental complexity. These items are important for all zoo animals, but are especially important for those with more intellectual capacity such as our closest living relatives, the great apes (Maple and Perkins, 1996).

Studies have found that enrichment increases the activity levels of all primate species residing in zoos (Gilloux, Gurnell, and Shepherdson, 1992; Little and Sommer, 2002; Wright, 1995).



With their tendency for low activity levels and lethargy, the provision of proper enrichment for zoo orangutans is especially important (Barbiers, 1985; Birke, 2002; Kim-McMormack, Smith, and Behie, 2016; Pizzutto et al., 2008; Tarou, Kuhar, Adcock, Bloomsmith, and Maple, 2004). According to a number of studies, activity levels of zoo orangutans increase in accordance with the amount of enrichment items provided and there is an increase in well-being (decrease of cortisol; increase of estradiol) and natural behaviors when environmental enrichment is provided (Wright, 1995; Tripp, 1985; Wilson, 1982; Perkins, 1992; Herbert and Bard, 2000; Pizzutto et al., 2008). A preference for higher, private locations in zoo orangutans was also found in Herbert and Bard's (2000) study, and Pizzutto et al. (2008) emphasized the importance of opportunities for activity and brachiation in elevated locations. From these studies, one can conclude that environments and enrichment are critical aspects that contribute to the well-being of zoo orangutans.

The two species of orangutan, the Sumatran orangutan (*Pongo abelii*) and the Bornean orangutan (*Pongo pygmaeus*), are recognized as the largest arboreal mammal, spending the majority of their time in the forest canopy (Ancorenaz et al., 2014; Galdikas, Briggs, and Ammann, 1999; Groves, 1999; Muir, Galdikas, and Beckenbach, 2000; Petter and Desbordes, 2013; Zhang, Ryder, and Zhang, 2001). In their natural habitat, researchers have found that orangutans spend the majority of their time foraging and eating (50-60%), resting (25-35%), and traveling (10-15%) (Fox, van Schaik, Sitompul, and Wright, 2004; Galdikas, 1988; Kanamori, Kuze, Bernard, Malim, and Kohshima, 2010; Knott, 1998; Mitani, 1989; Mitani, Grether, Rodman, and Priatna, 1991; Morrogh-Bernard et al., 2009; Rodman, 1979; Rodman, 1984; Rodman, 1988; Wich, Utami-Atmoko, Setia, Djyosudharmo, and Geurts, 2006). According to McPhee and Carlstead (2010), these natural behaviors can be indicators that zoo animals' needs are being met, they are healthy, and the captive environment is optimal. Maintaining natural behaviors in zoo animals is also a top priority for *ex situ* conservation efforts such as conservation education and the reintroduction of captive-bred animals (McPhee and Carlstead, 2010). An activity budget - the total time spent devoted to various activities each day - is a useful tool for evaluating zoo animals' health, expression of natural behaviors, and overall wellbeing (Bean, 1998; Melfi and Feistner, 2002). Understanding the needs of zoo animals and designing habitats for them to express and hone natural behaviors are important elements of zoo animal welfare and conservation (McPhee and Carlstead, 2010; Stoinski, Beck, Bloomsmith, and Maple, 2003).

Studies have found that zoo orangutans spend about 10-20% of their time feeding and that the rest of their time is typically spent being idle or inactive (up to 70%) (Herbert and Bard, 2000; Pizzutto et al., 2008; Perkins, 1992; Wright, 1995). Research by Edwards and Snowden (1980), and Perkins (1992) suggest that this inactivity could partially be attributed to the diet of zoo

orangutans and their natural feeding strategies. A wild orangutan will either elicit a 'sit and wait' or a 'search and find' strategy depending on the fruiting season (Morrogh-Bernard et al., 2009; Bastian, Zweifel, Vogel, Wich, and van Schaik, 2010; Knott, 1998; Wich et al., 2006). These feeding behaviors are important for zoo management because the daily provision of food by caretakers can negate the need to forage, in turn impacting daily activity levels and health (Knott, 1998).

Knott (1998) found that wild orangutans will binge on fruit when it is available, storing the excess energy for when food becomes less abundant. This natural tendency to overindulge on available food, the ability to store fat efficiently, and the common low levels of activity in zoo orangutans could explain the predominance of obesity and obesity-associated diseases in zoo orangutans (Mackinnon, 1974; Maple, 1980; Knott, 1998). Respiratory and parasitic diseases could be associated with excessive ground dwelling due to the close proximity of feces that would normally be avoided by predominantly residing in the canopy of vertical space (Mul, Paembonan, Singleton, Wich, and Bolhuis, 2007; personal conversation Perkin, 2015). Based on the arboreality and preferred height of orangutans in the wild, Herbert and Bard (2000) suggest that environments for zoo orangutans should include at least one location that allows them to increase their altitude and have the option of being out of the public's view. At the Cincinnati Zoo and Botanical Garden (CZBG), there is one faux tree that provides this increase in altitude, but it is often only used to retrieve food or an enrichment item keepers have placed there, and is not a preferred location to reside throughout the day (Figure 1).

While previous studies on zoo orangutans have shown a preference for higher, private locations in their enclosures, anecdotal observations of the orangutans at the CZBG and other zoos referenced in this paper suggest that zoo orangutans spend the majority of their time on the ground even with the provision of enrichment. Could this be a personal preference for the ground or would there be a change in preference if there were a variety of vertical options? Beyond the preferences of orangutans at the CZBG, there was interest in the observations of keepers at other various facilities to see if they also observed a preference for the ground. Understanding if there is a preference for locations that allow for increased altitude in zoo orangutans would impact the way orangutan enclosures are designed. To begin to answer this question, an informal interview survey was created, and conversations were held with five individuals at five different AZA facilities.

My Approach to Inquiry

A proposal was submitted for this informal survey project to the Orangutan Species Survival Plan (SSP) Steering Committee and Advisors for review. Approval for this project was contingent on communicating through the assigned Institutional Representative (IR) at any zoo contacted. With this approval, a list of the IRs at each of the 55 Association of Zoos and Aquariums (AZA) facilities that are members of the Orangutan SSP were provided to me and the SSP sent out an e-mail with information regarding my project to each IR.

A total of five facilities participated in the study. Some required an internal approval process, which required consent forms or additional approval information. Upon approval and agreement to participate, each keeper/IR was given the option of setting up a time to talk on the phone or Skype. For those without the capabilities

Photo 1 (left) Geomorph. (2009). *Jungle Trails - Orangutan and Gibbon Exhibit*. The faux tree is in the center. The trees in the background are on the other side of the exhibit barriers and cannot be reached by the animals. There are six other trees in the exhibit that are not pictured, but those that are not wrapped in hot wire to prevent escape are deceased and have been pruned, disqualifying them as a vertical structure. Photo by Jeremy Phan.



Phan, J. (2017). *Jungle Trails Outdoor Orangutan Exhibit*. The faux tree is on the far left. The other trees to the right in the yard are either wrapped in hot wire to prevent escape or are deceased and have been pruned, disqualified as vertical structures. The trees in the background are on the other side of the exhibit barriers and cannot be reached by the animals.

to Skype or the time to talk on the phone, the questions were sent via e-mail to be filled out and returned. Informal interviews, that lasted typically ~30 minutes, were deemed the best approach for collecting a greater depth of information and higher return rate given the small sample size. Informal survey questions collected information about the individual orangutans at each facility and their indoor/outdoor enclosures to rule out any variable that could influence behavioral activity and structure use (Table 1).

Results

From the five conversations, there appeared to be a common anecdotal observation of a preference for locations with a visual stimulus rather than increased altitude for the 14 orangutans discussed. A number of the keepers said they observed a possible preference for locations that allowed for human observation such as visitor viewing areas and locations that the keepers frequent either during feeding or when checking on individuals. Two facilities' keepers observed an anecdotal preference for shade in their orangutans. From these two points of observation, there could be a stronger preference for visual or social stimulation and comfort level over altitude and height of location in zoo orangutans.

IRs also commented on the perceived stability of the orangutans while using structures that allowed for increased height off of the ground or brachiation between structures. As the largest arboreal mammal, orangutans must be very strategic and careful with where they choose to place and distribute their weight as they brachiate (Ancorenaz et al., 2014; Galdikas, Briggs, and Ammann, 1999; Petter and Desbordes, 2010). From one keeper's perspective, it would seem that orangutans might prefer pathways that allow for

two to three hand/foot holds. Making pathways and structures with at least two levels of brachiation could increase the stability of movement for orangutans and increase their use of these vertical structures from this observation.

A difference in activity level between infants and adults was also noted through these conversations. Two of the facilities interviewed had infants. At both locations, the keepers commented on the infant's use of all areas of the enclosure and that the females caring for the infant preferred the ground or lower levels of the enclosure when carrying the infant, potentially due to the added weight. One keeper mentioned that due to having a flooded floor in their exhibit, the infant was forced to learn how to climb and brachiate at an early age. She viewed this as a positive aspect of their enclosure because their infant is very active and capable of traversing all areas of the enclosure where it seems like other infants in this age range spend the majority of their time on the ground with their mothers when ground dwelling is available. From this keeper's perspective, eliminating the option of ground dwelling in their enclosure has helped contribute to their orangutans' health, activity level, and overall amount of time spent exhibiting natural behaviors.

Discussion

Studies have shown that the main difference between zoo and wild orangutans' allocation of time is in their resting and foraging. These two activities are almost exactly switched with the zoo population spending up to 70% of their time resting (wild, 23-35%) and 10-20% of their time eating (wild, 50-60%) (Bastian et al., 2010; Herbert and Bard, 2000; Knott, 1998; Perkins, 1992; Pizzutto et al., 2008; Wich et al., 2006; Wright, 1995). With the addition of enrichment items and unique ways in which to break up their day, zookeepers continue to provide the best care and stimulation to these animals possible. However, as orangutans are prone to obesity and a sedentary lifestyle, it is important to compare the environments of zoo and wild orangutans. Looking at the habitats in which zoo orangutans live, one cannot help but notice that most of the vertical options available are designed for brachiating and locomotion. This is great for providing the option for locomotion, however if orangutans spend 23-35% of their time resting in the wild, and there are limited options for active rest in the canopy, why would we expect zoo orangutans to use these vertical structures for any other reason than retrieving enrichment and food? Herbert and Bard's (2000) study encourages institutions to provide at least one vertical option for the health and well-being of zoo orangutans, but one option cannot compare to the dense forests in which this species thrives. While a preference for increased altitude was not noted in any of the orangutans living at the five facilities surveyed, zoo orangutans might exhibit a greater use of brachiation and locomotion structures if the pathways allowed for two to three hand/footholds. An even greater draw would be a variety of higher, more comfortable areas for active rest. Based on the anecdotal observations and conversations from this study, these changes could increase activity levels, overall health and well-being, and encourage more frequent displays of natural behavior.

This study was conducted under the assumption that zoos are trying to elicit species-typical behaviors. An important aspect in maintaining natural behaviors in zoo animals is that they are good indicators of health and well-being, and are essential for *ex situ* conservation and *in situ* conservation education (McPhee and Carlstead, 2010). Understanding the needs of zoo animals and designing habitats for them to express and hone natural behaviors

are crucial elements for zoological institutions in upholding their mission of animal welfare, education, and conservation (AZA, 2017; McPhee and Carlstead, 2010). For these reasons, it is vital for keepers to begin discussions and conversations of this nature. More studies focused on zoo orangutan preference and uses of their environment are needed and studies that consider the whole zoo population should be conducted in the future.

Limitations and Directions for Future Research

This study question attempted to address the use and location preference of all orangutans housed in AZA facilities. One aspect that would have improved the approach taken would have been to ask keepers to send photos of the enclosures prior to chatting and asking them to search for or gain access to blueprints if these exist. Blueprints would have been helpful for determining the exact measurements of structures rather than asking keepers to take their best guess at enclosure dimensions.

Another factor to consider in support of conducting more individual zoo studies on location preference and activity budgets of zoo orangutans is the diversity of personality and individual preferences of this species. Observations of wild orangutans show that daily percentages of each activity (foraging and eating, resting, and traveling) vary between age groups, geographic location, and even seasons (Galdikas, 1988; Knott, 1998; Mitani, 1991; Wich et al., 2006). For zoo individuals, factors such as upbringing, previous experiences, and sociality can greatly influence their choices, habits, preferences, and activity. A number of studies between primate group members and enrichment preference have found that factors such as age, environment, and sex all have an influence on the items primates prefer to interact with, as well as the amount of time they spend with that item (Bloomsmith, Finlay, Merhalski, and Maple, 1990; Novak et al., 1993; Perkins, 1992; Pruett and Bloomsmith, 1992; Shepherdson, Carlstead, and Wielebnowski, 2004; Videan, Fritz, Schwandt, Smith, and Howell, 2005). Enclosure structures can be viewed much like enrichment items that are stationary. The main difference of these items is that they are typically permanent or too difficult to move, rotate, or change in order to provide the variety that would classify them as enrichment. Chamove and Anderson (1989) and Swaisgood and Shepherdson (2005) recommend that institutions regularly evaluate the effectiveness of their enrichment. The same should be done for the structures and more permanent aspects of zoo animals' environments. Conducting studies on preference and activity budgets prior to zoo-wide surveys would help account for this variation in individuals.

If future studies are going to attempt to draw conclusions from this information, focus should be placed on collecting data at individual facilities first. Understanding orangutans' allocation of time, use of their enclosure space and location preference at each facility will be important before attempting another zoo-wide survey. It would be beneficial if each facility used the same protocol and approach for collecting data so that a survey of vertical structure use and location preference could then be conducted in the future. This would be a long process but would ensure scientific accuracy. Conclusions could be drawn from this data and one would be able to determine the significance of providing more areas for active rest at increased altitude and increasing the stability of pathways to these areas of active rest for zoo orangutans.

Orangutan Information	Rational
Sex (M/F)	Rule out sex as a variable
Age	Rule out age as a variable
Background (zoo-born/hand-raised/surrogate/ recent transfer)	Rule out if orangutan history influenced behavior and preference
Number of individuals at facility	Rule out behavioral differences due to number of orangutans
Social Dynamics (# family groups, # breeding/nonbreeding pairs/# solitary/fission fusion/visual access to other social groups/normal repertoire of behaviors	Rule out social dynamics as behavior influencer
Health (physical ailments/geriatric/ on medication)	Rule out health and physical fitness as a variable
Enclosures (Indoor/Outdoor)	Rational
Dates of manufacture	Factor for new/old enclosure design as behavior indicators
Height	Factor for differences in height for behavioral differences
Area	Factor for amount of area
Volume	Factor for volume of enclosure
Renovations (dates & description)	Factor for renovations as behavior indicators
Behavioral differences since renovation	Note behavioral differences if any from renovation
Types of vertical space structures: stationary (faux trees, real trees, platforms) / moveable (hammocks, vines, firehose, ropes)	Categorize structures and factor differences in type, availability, and influence on behavior among facilities
Most used structure	Rule out or identify certain preferred structures
Preferred locations	Rule out and identify commonalities amongst preferred locations
Number of orangutans in enclosure at once	Rule out # of orangutans in enclosure as behavior influencer
Preferred ground areas	Rule out / identify commonalities amongst preferred ground areas

Table 1 Shows the questions each zookeeper was asked about their facility's orangutans and their indoor/outdoor enclosures with the rationale behind each question.

Conclusion

This inquiry attempted to answer the question, do zoo orangutans prefer the ground at other AZA-accredited facilities and would we see a change in behavior if zoo orangutans were given more vertical options for locomotion and active rest? While scientific conclusions could not be drawn from the information collected from this small pilot group, a great deal of information was gained through the process of talking with orangutan keepers about their observations of their orangutans' enclosures, preferences, and usage of vertical

structures. The approach taken to answer this initial question can benefit future studies and has the potential to act as a building block for future studies of this nature. Zookeepers and scientists should explore the topics and questions that arose from this process and step out as conservation leaders as we find ways to work together and create partnerships amongst professional institutions for the conservation and protection of endangered species.

There is still much to learn about the orangutan. Future studies should focus on the activity and location preference of zoo orangutans at individual facilities and then attempt to take a collective survey of all AZA facilities. This information will be beneficial for influencing zoo orangutan environment design and improving future renovations or additions to current zoo exhibits. Conclusions could be drawn from the collection of this data and one would be able to determine the significance of providing more vertical structures that allow for brachiation to areas of active rest for zoo orangutans. These additions could improve the overall activity, health, and well-being of zoo orangutans and contribute to the educational conservation mission of zoological institutions.

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References

Ancorenaz, M., Sollmann, R., Meijard, E., Hern, A.J., Ross, J., Samejima, H., ... & Goossens, B. 2014. Coming down from the trees: Is terrestrial activity in Bornean orangutans natural or disturbance driven? *Scientific Reports* 4:4024.

AZA. 2017. Association of Zoos & Aquariums. Retrieved from <https://www.aza.org/>

Bastian, M.L., Zweifel, N., Vogel, E.R., Wich, S.A., and van Schaik, C.P. 2010. Diet traditions in wild orangutans. *American Journal of Physical Anthropology* 143(2):175-187.

Barbiers, R.B. 1985. Orangutans: Color preference for food items. *Zoo Biology* 4:287-290.

Bean, A. 1998. The ecology of sex differences in great ape foraging behaviour and hunter gatherer subsistence behavior. *Comparative Primate Socioecology* 349.

Bloomsmith, M.A., Finlay, T.W., Merhalski, J.J., and Maple, T.L. 1990. Rigid plastic balls as enrichment devices for captive chimpanzees. *Laboratory Animal Science* 40(3):319-322.

Birke, L. 2002. Effects of browse, human visitors and noise on the behavior of captive orangutans. *Animal Welfare* 11:189-202.

Edwards, S.D., and Snowdon, C.T. 1980. Social behavior of captive, group-living orangutans. *International Journal of Primatology* 1(1): 39-62.

Fox, E.A., van Schaik, C.P., Sitompul, A., and Wright, D.N. 2004. Intra- and interpopulational differences in orangutan (*Pongo pygmaeus*) activity and diet: implications for the invention of tool use. *American Journal of Physical Anthropology* 125(2):162-174.

Galdikas, B.M. 1988. Orangutan diet, range, and activity at Tanjung Puting, Central Borneo. *International Journal of Primatology* 9(1): 1-35.

Galdikas, B.M., Briggs, N.E., and Ammann, K. 1999. *Orangutan odyssey*. Harry N Abrams Inc.

Gilloux, I., Gurnell, J., and Shepherdson, D. 1992. An enrichment device for great apes. *Animal Welfare* 1:279-289.

Groves, C.P. 1999. The taxonomy of orang-utans. *Orang-utan Action Plan*, 27-30.

Herbert, P.L., and Bard, K. 2000. Orangutan Use of Vertical Space in an Innovative Habitat. *Zoo Biology* 19:239-251.

Kanamori, T., Kuze, N., Bernard, H., Malim, T.P., and Kohshima, S. 2010. Feeding ecology of Bornean orangutans (*Pongo pygmaeus morio*) in Danum Valley, Sabah, Malaysia: a 3-year record including two mast fruitings. *American Journal of Primatology* 72(9):820-840.

Kim-McCormack, N.N.E., Smith, C.L., and Behie, A.M. 2016. Is interactive technology a relevant and effective enrichment for captive great apes? *Applied Animal Behaviour Science* 185:1-8.

Knott, C.D. 1998. Changes in orangutan caloric intake, energy balance, and ketones in response to fluctuating fruit availability. *International Journal of Primatology* 19(6):1061-1079.

Little, K.A., and Sommer, V. 2002. Change of enclosure in langur monkeys: Implications for the evaluation of environmental enrichment. *Zoo Biology* 21:549-559.

MacKinnon, J. 1974. The behaviour and ecology of wild orang-utans (*Pongo pygmaeus*). *Animal Behaviour* 22(1):3-74.

Maple, T.L. 1980. Orang-utan Behavior. Van Nostrand Reinhold Co.

Maple, T.L., and Perkins, L.A. 1996. Enclosure furnishings and structural environmental enrichment. *Wild mammals in captivity: principles and techniques for zoo management*, 212-223.

McPhee, M.E., and Carlstead, K. 2010. The importance of maintaining natural behaviors in captive mammals. *Wild mammals in captivity: principles and techniques for zoo management*, 2:303-313.

Melfi, V.A., and Feistner, A.T.C. 2002. A comparison of the activity budgets of wild and captive sulawesi crested black macaques (*Macaca nigra*). *Animal Welfare* 11:214.

Mitani, J.C. 1989. Orangutan activity budgets: monthly variations and the effects of body size, parturition, and sociality. *American Journal of Primatology* 18(2):87-100.

Mitani, J.C., Grether, G.F., Rodman, P.S., and Priatna, D. 1991. Associations among wild orang-utans: sociality, passive aggregations or chance? *Animal Behaviour* 42(1):33-46.

Moss, A., Esson, M., and Francis, D. 2010. Evaluation of a third-generation zoo exhibit in relation to visitor behavior and interpretation use. *Editorial Assistant*, 11.

Mul, I.F., Paembonan, W., Singleton, I., Wich, S.A., and Bolhuis, H.G. 2007. Intestinal parasites of free-ranging, semicaptive, and captive pongo abelii in Sumatra, Indonesia. *International Journal of Primatology* 28(2):407-420.

Muir, C.C., Galdikas, B.M.F., and Beckenbach, A.T. 2000. mtDNA sequence diversity of orangutans from islands of Borneo and Sumatra. *Journal of Molecular Evolution* 51(5):471-480.

Morrogh-Bernard, H.C., Husson, S.J., Knott, C.D., Wich, S.A., van Schaik, C.P., van Noordwijk, M.A., ... & bin Sakong, R. 2009. Orangutan activity budgets and diet. *Orangutans: Geographic variation in behavioral ecology and conservation*, 119-133.


Novak, M.A., Musante, A., Munroe, H. O'Neill, P.L., Price, C., and Suomi, S.J. 1993. Old, socially housed rhesus monkeys manipulate objects. *Zoo Biology* 12:285-298.

Perkins, L.A. 1992. Variables That Influence the Activity of Captive Orangutans. *Zoo Biology* 11:177-186.

Petter, J. J. and Desbordes, F. 2013. *Primates of the World: An Illustrated Guide*. Princeton University Press.

- Pizzutto, C.S., Nichi, M., SGAI, M.G.F.G., CORRÊA, S.H.R., VIAU, P., BERESCA, A.M., ... and GUIMARÃES, M.A.D.B.V. 2008. Effect of environmental enrichment on behavioral and endocrine aspects of a captive orangutan (*Pongo pygmaeus*). *Laboratory Primate Newsletter* 47(2):10-14.
- Pruetz, J.D. and Bloomsmith, M.A. 1992. Comparing two manipulable objects as enrichment for captive chimpanzees. *Animal Welfare* 1(2): 127-137.
- Rabb, G.B. 2004. The evolution of zoos from menageries to centers of conservation and caring. *Curator: The Museum Journal* 47(3): 237-246.
- Robinson, M.H. 1998. Enriching the lives of zoo animals, and their welfare: where research can be fundamental. *Animal Welfare* 7(2): 151-175.
- Rodman, P.S. 1979. Individual activity patterns and the solitary nature of orangutans. *The Great Apes*, 234-255.
- Rodman, P.S. 1984. Foraging and social systems of orangutans and chimpanzees. *Adaptations for foraging in nonhuman primates*, 134-160.
- Rodman, P.S. 1988. Diversity and consistency in ecology and behavior. *Orangutan biology*, 31-50.
- Shepherdson, D.J., Mellen, J.D., and Hutchins, M. (Eds.). 2010. *Second nature: Environmental enrichment for captive animals*. Smithsonian Institution.
- Shepherdson, D.J., Carlstead, K.C., and Wielebnowski, N. 2004. Cross-institutional assessment of stress responses in zoo animals using longitudinal monitoring of faecal corticoids and behaviour. *ANIMAL WELFARE-POTTERS BAR THEN WHEATHAMPSTEAD*, 13, S105-S114.
- Shettel-Neuber, J. 1988. Second and Third Generation Zoo Exhibits: A Comparison of Visitor, Staff, and Animal Responses. *Environment and Behavior* 20(4):452-473.
- Sommer, R. 1974. Tight spaces: Hard architecture and how to humanize it. (Vol. 322). Prentice Hall.
- Stoinski, T.S., Beck, B.B., Bloomsmith, M.A., and Maple, T.L. 2003. A behavioral comparison of captive-born, reintroduced golden lion tamarins and their wild-born offspring. *Behaviour* 140(2):137-160.
- Tarou, L.R., Kuhar, C.W., Adcock, D., Bloomsmith, M.A., and Maple T.L. 2004. Computer-assisted enrichment for zoo-housed orangutans (*Pongo Pygmaeus*). *Animal Welfare* 13:445-453.
- Videan, E.N., Fritz, J., Schwandt, M.L., Smith, H.F., and Howell, S. 2005. Controllability in environmental enrichment for captive chimpanzees (*Pan troglodytes*). *Journal of Applied Animal Welfare Science* 8(2): 117-130.
- Wich, S.A., Utami-Atmoko, S.S., Setia, T.M., Djoyosudharmo, S., and Geurts, M.L. 2006. Dietary and energetic responses of *Pongo abelii* to fruit availability fluctuations. *International Journal of Primatology* 27(6):1535-1550.
- Wilson, S.F. 1982. Environmental Influences on the Activity of Captive Apes. *Zoo Biology* 1:201-209.
- Wright, B.W. 1995. A novel item enrichment program reduces lethargy in orangutans. *Folia Primatologica* 65(4):214-218.
- Zhang, Y.W., Ryder, O.A., and Zhang, Y.P. 2001. Genetic divergence of orangutan subspecies (*Pongo pygmaeus*). *Journal of Molecular Evolution* 52(6):516-526.

Media Cited

- Geomorph. 2009. *Jungle Trails - Orangutan + Gibbon Exhibit*. [photograph]. Retrieved from <https://www.zoochat.com/community/media/jungle-trails-orangutan-and-gibbon-exhibit.65401/>
- Phan, J. (2017, September 6). *Jungle Trails Outdoor Orangutan Exhibit*. [photograph]. 

Happy National Zoo Keeper Week from everyone at AAZK!



Make sure to use this week to recognize all of your teams' and chapters' accomplishments.



Don't forget to use the #NZKW2018 selfie papers to show the world what you do!



When Weight Loss is Everyone's Gain

Kelsey Barker, Animal Keeper
Denver Zoo
Denver, Colorado

The Village Hall team at Denver Zoo constantly monitors and manages the weight of all animals in their care through diet changes and routine weight collection. Each animal in the section has a target weight range for ideal health and body condition. The team strives to maintain animals in this range to avoid weight-related health risks. In November 2016, Jilin Kalong, a male Asian small-clawed otter, weighed two pounds heavier than the other six otters at Denver Zoo and was above his target weight range. Unfortunately, managing the weight of this over-conditioned otter through diet management alone was showing little improvement. As the team brainstormed new options and ideas for decreasing his weight, they found inspiration from their teammates.

The Village Hall section at Denver Zoo manages a variety of Southeast Asian species, including Asian small-clawed otters (*Aonyx cinereus*), white-cheeked gibbons (*Nomascus leucogenys*), fishing cats (*Prionailurus viverrinus*), and clouded leopards (*Neofelis nebulosa*). Village Hall is part of a larger team called Toyota Elephant Passage and Predator Ridge. Within this larger team there are five sections: Village Hall, Predator Ridge, Rhino/ Tapir, Pachyderms, and Elephants. Some keepers on the larger team specialize in one section, while others are cross-trained and work in multiple sections. This team dynamic and structure fosters frequent communication, brainstorming, and inspiration within a large group of keepers caring for a variety of species.

Photo 1. Jilin Kalong, a male Asian small-clawed otter, running on One Fast Cat exercise wheel in back holding during a training session focused on exercise.





Photo 2 Jilin Kalong doing a “climb” behavior that develops strength.



Photo 3 Jilin Kalong doing an “up” behavior that encourages strength building for his legs and core.

The collaborative nature of the Toyota Elephant Passage and Predator Ridge team led Jilin Kalong’s keepers to a new solution for weight management. Elephant programs in Association of Zoos and Aquariums (AZA) facilities are required to have a written exercise program in place for all individuals as well as the herd (Section 3.3.2.4), so the Denver Zoo elephant keepers exercise each elephant in their care at least three times per week. The Predator Ridge team was working on encouraging exercise with social African carnivores by being innovative with space within their rotational exhibit. These practices and successes inspired the

Village Hall team to start incorporating exercise into Jilin Kalong’s daily routine in an effort to lower his body weight and improve his body condition.

Relying on diet alone as a weight management tool proved difficult with this social species. Although keepers often separate this group of six tigers for training and feeding their allotted diet, social feedings are also important for bonding and group cohesion. Including exercise in Jilin Kalong’s weight management allows keepers to maintain social feedings and eliminate social stresses

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Photo 4 Bu, a female Asian small-clawed otter, performing the “pull-up” behavior that increases strength in her arms and core.

due to large diet imbalances amongst the group. Although keepers had previously encouraged exercise through enrichment such as climbing structures and puzzle feeders, they wanted to take additional steps. The team began by using established behaviors such as ‘stand’ and ‘laser target’ to increase Jilin Kalong’s mobility and exercise during training sessions.

Considering exercise during training sessions allows keepers to take previously trained husbandry behaviors and use them in new ways with new goals. In a ‘stand’ behavior, the otter places its paws up on the mesh with their back legs extended, standing tall. This behavior is used to look at an animal’s abdomen and paws, but is now also being used to strengthen muscles and encourage stretching when asked with increased duration. The ‘laser target’ behavior asks Jilin Kalong to put his nose to a laser pointed anywhere in the stall. This behavior was trained with the goal of moving him around the holding space for shifting and as a precursor to train another behavior. It is now also being used to increase cardiovascular activity with Jilin Kalong as keepers are asking him to travel further distances and climb on various structures.

After seeing the benefits of including regular exercise in Jilin Kalong’s training sessions, keepers are now training him new exercise behaviors that focus on strength, cardio, and stretching. By using the ‘laser target’ and then slowly fading it out, Jilin Kalong was trained to run on a cat exercise wheel (One Fast Cat®, 708 Via Alondra, Camarillo, CA, info@onefastcat.com, www.onefastcat.com) to increase cardiovascular activity (Photo 1). He was trained to climb the mesh and hold for duration to increase upper body

strength (Photo 2). To increase strength and cardio, keepers also captured a digging behavior and they used a target stick to approximate a jumping behavior. Once ‘jump’ was established, keepers used the target stick in a similar way to train an ‘up’ behavior, where Jilin Kalong stands on his back legs without holding onto the mesh (Photo 3). As he continues to build duration with ‘up’, this behavior increases core and leg strength. Increasing the duration of all these behaviors is impactful in maximizing their exercise potential.

Although the original goal was to specifically improve Jilin Kalong’s body score and weight, Village Hall keepers now apply this exercise management technique to all of the Asian small-clawed otters in their care. This proactive approach strives to improve overall fitness of the otters and will be included with diet changes in their weight management program. Although not all of the otters are trained a ‘laser target,’ the keepers are still able to increase mobility within sessions with a standard ‘target’ behavior. Asking the animals to jump or climb to reach the target stick, or asking them to travel further distances across the stalls to reach the target stick, accomplishes goals of stretching, strength building, and increasing cardiovascular activity. Keepers have also increased frequency and duration of an established ‘stand’ behavior with the new intention of stretching and strength building. All otters were quickly trained to ‘climb’ to improve strength. One of the otters, Bu, learned a pull-up behavior on a PVC device that works on increasing her arm and core strength (Photo 4). Although this behavior took months to train and had an end goal of strength building, the learning process also promoted exercise through stretching as she learned to reach up and grab onto the pull-up bar. Otters in the group are also learning ‘jump,’ ‘laser target,’ ‘up,’ and ‘run’ to increase exercise opportunities in their training sessions.

Increasing exercise through training has resulted in numerous benefits. Keepers see an increase in Jilin Kalong’s activity on exhibit with the new exercise program, and he is often running on the exercise wheel outside of sessions. He is observed running on his own throughout the day when keepers place the exercise wheel on exhibit for enrichment (Photo 5). Behaviors that were simple and quick to train like ‘climb’ and ‘up’ also add variety and fun to medical and husbandry sessions. Training these exercise

Witnessing the success with the Asian small-clawed otters encouraged keepers to start thinking about exercise for the other animals in their section.

behaviors also creates a new and unique experience for guests, and it allows keepers to share unique and interesting husbandry practices involved in taking care of these species.

Witnessing the success with the Asian small-clawed otters encouraged keepers to start thinking about exercise for the other animals in their section. Vinh, a female white-cheeked gibbon, was trained a ‘let’s go’ behavior that allows keepers to ask her to follow them and brachiate around her exhibit (Photo 6 and Photo 7). Although she moves around her exhibit throughout each day, she often stops at each island to rest, forage, or socialize. By



Picture 5 Jilin Kalong running on One Fast Cat® exercise wheel on exhibit.

including this movement in training sessions, keepers are able to increase the duration and repetition of her movements which promotes cardio and strength. Vinh's exhibit includes islands and ropes above guest pathways, so this behavior and exercise routine also provides an unforgettable experience for guests.

Exercise through training sessions has also been applied to Ronaldo, a male fishing cat. He was trained a 'bench' behavior which requires him to jump onto a platform that the keeper points to. Keepers choose different platforms such as a crate and a plastic barrel to vary the heights of his leap onto the bench (Photo 8). This behavior increases strength, but also supports cardio when he is asked for the behavior multiple times in a row. Once the behavior was established, and Ronaldo was able to 'bench' on various platforms and hold for duration, taller platforms or benches were introduced. Ronaldo would often fail to reach the top when first benching onto a tall barrel, preventing him from completing this behavior to criteria and holding for duration. With continued training and exercise, Ronaldo was soon able to successfully 'bench' on the tall barrel, allowing him to hold for duration (Photo 9). This improvement in his ability to leap onto taller platforms was proof of his increased strength and the success of the program.

In addition to promoting exercise through the 'bench' behavior, keepers have increased the frequency and duration, they ask for 'stand' to encourage stretching, and they have increased distance and repetitions of 'point follows' around the holding space to increase mobility and encourage cardio training. Promoting exercise during training sessions became more important in increasing Ronaldo's mobility because the birth of a fishing cat kitten changed

his routine and decreased his access space during certain times of the day.

The three clouded leopards at Denver Zoo have also benefited from being trained 'bench.' Not only has this been great exercise, but with the older and less mobile female cat, Tenchi, it has also given keepers a great tool to measure her movement when assessing her welfare. With the same goal of encouraging exercise while monitoring mobility, keepers also began walking Tenchi up and down her exhibit transfer using her 'target' behavior. Keepers noted that since Tenchi's mobility has increased in training sessions, she is more mobile overall and is more comfortable moving up



Photo 6 Vinh, a female white-cheeked gibbon, brachiating across exhibit ropes during exercise training session.



Picture 7 Vinh, a female white-cheeked gibbon, moving across exhibit ropes during an exercise training session.

and down the transfer on her own. She has scored higher on her welfare assessment ratings, and keepers will now quickly identify any signs of pain or decrease in mobility.

Some of these new exercise behaviors have also provided new and unexpected benefits for the team. For example, the 'bench' behavior for the clouded leopards led to an easier way to weigh

these animals. Placing the scale on the bench reduces the chance of their long tail resting on the floor and affecting the reading. With this method, their tail hangs down off the end of the scale and bench allowing an accurate weight reading (Photo 10). The otters' 'climb' behavior gives keepers a closer look at their abdomen than the previously trained 'stand' behavior. This allows keepers to evaluate nipple development and add a tactile component to their abdominal inspection.

Increasing exercise among the animals in Denver Zoo's Village Hall section did not come without challenges. Although the team was excited about developing and improving this new program across their area, they had many other priorities for the collection. The team had to balance training new exercise behaviors with other priority behaviors including voluntary injections and shifting. Keepers strive to include all aspects of each animal's husbandry into daily training sessions, including physical body exams, medical behavior training, as well as the newly implemented exercise. Keepers were also challenged with creating and thinking of new, simple yet effective exercise behaviors that encourage natural behaviors.

As development and formalization of this exercise program continued, the Village Hall keepers wanted to include exercise through training, space, diet, enrichment, and social dynamics in the records. They worked with Denver Zoo's registrar to add an Exercise category to their TRACKS® record keeping software. Now

Picture 8 Ronaldo, a male fishing cat, performing a "bench" behavior on a trash can to increase strength.



Picture 9 Ronaldo, a male fishing cat, successfully performing a "bench" behavior on the tall blue barrel showing an increase in strength from the beginning of training this behavior.





Photo 10 Clouded leopard, Tenchi, performing a "bench" behavior with the goal of exercise and strength building as well as weight collection.

that the team is able to track and document the animals' exercise in one location in the records, they can more easily evaluate its effectiveness in body condition, social dynamics, and activity level. The collaborative nature of the Toyota Elephant Passage and Predator Ridge team sparked creativity in the Village Hall section. As the Village Hall keepers continue to develop ways to increase exercise in their collection, they are sharing their successes with the larger team as well. Frequent communication amongst all keepers is increasing creativity for new exercise opportunities despite different animal species between the sections.

Advancing the fitness of the animals in our care also enhances guest experience and perception. Exercise and training benefit physical and mental health, therefore improving overall fitness, which guests can see through body condition and behavior. Observing healthy and fit animals is a great way for guests to see that the collection is well cared for. Encouraging natural behaviors and exercise through training on exhibit provides a unique opportunity to talk with guests about the countless aspects of animal care and husbandry we provide for the animals.

The Village Hall team has observed many benefits since implementing these exercise management strategies. In October 2017, after one year of exercise implementation with no diet changes, Jilin Kalong, the Asian small-clawed otter mentioned at the beginning of this paper, has lost about 13% of his body weight, and he is within his target weight range. He has also exhibited an increase in activity and improved body condition. Ronaldo, the fishing cat, has shown an increase in strength through his ability

to jump higher as well as an improved body condition. Tenchi, the older clouded leopard, has been more comfortable in new places and has an increase in activity. Vinh, the female white-cheeked gibbon, has an improved body score.

The animals are experiencing better animal welfare as keepers are encouraging natural behaviors through training and exercise. By focusing on cardiovascular activity, strength, and stretching, keepers are seeing improved body condition in many animals in the Village Hall section. Incorporating simple yet effective exercise behaviors into each animal's repertoire also allows keepers to increase variety within sessions. Medical sessions and learning sessions can be broken up with these quick, easy, and fun behaviors. This program has led to improved management with weight collection and welfare assessment as well. Developing this program and implementing exercise in daily training sessions has been fun and rewarding for both animals and keepers. 🐼

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Zimbabwe or Bust

Hollie Wells and Katie Prinsen, Keepers
Rolling Hills Zoo
Salina, KS

Lycaon pictus are an endangered species of canid. This impressively intelligent and social species used to thrive in their natural environment, but are now dwindling at less than an estimated 7,500. Dr. Gregory Rasmussen, founder of the Painted Dog Research Trust and a prominent conservationist and researcher who has dedicated his life to this incredible species for the last 28 years, gave a presentation in early 2015 at the Kansas City Zoo. This particular presentation is where our adventures really began. Because our hearts had already been captured by

African painted dogs, we immediately felt connected to Dr. Rasmussen's cause and were compelled to do something more to help him help painted dogs.

We immediately began researching and brainstorming on what we could do to become more involved. Several hours we spent in contact with the Painted Dog Protection Initiative, a group based in the United States that works with Dr. Rasmussen's PDRT. We decided we would like to join the zoos that hold a dog days event, dedicated to painted dog awareness.

The next day at work we pitched the idea of participating in a Dog Days Event. This event is now an annual occurrence at our zoo. Because we held this event and donated to the cause, PDPI organized for Dr. Rasmussen to visit our zoo the following year. It was during this visit that he presented two of us with this life changing opportunity to travel to Zimbabwe, Africa and experience firsthand the work done by himself and his staff at the Painted Dog Research Trust. The offer was contingent on a donation of \$10,000 to the trust.

Eight short months of hard work, six fundraising events, and several donations later we unbelievably reached our goal. We then made our official arrangements to be in Zimbabwe. The two weeks we spent at PDRT were incredible, one of which was spent at the facility while the other was spent in the field. At the facility we participated in a number of different conservation projects, attended several lessons that Dr. Rasmussen presented to his students, and learned about the ecology and the local cultures. We then spent the second week in Hwange National Park tracking and researching painted dogs with Dr. Rasmussen and his students.

We spent the majority of our time at the PDRT facility with the students working for

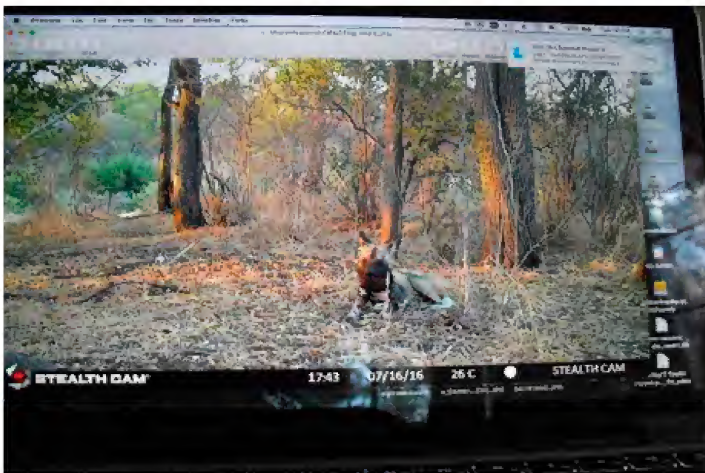


Photo 1 Camera trap photo used for research.
Photo credit Katie Prinsen.

Dr. Rasmussen. We were fortunate enough to assist them in their current research projects. Tafadzwa Shumba has been working with Dr. Rasmussen for the past five years and aspires to be a competent field biologist. He is researching how dog coat markings can be used as a proxy for genetic relatedness. Rejoice Muzenda is a student at the University of Zimbabwe and was researching disturbances at den sites and how it affects the dogs, especially in reference to pup growth and pack hunting patterns. Esther Ruvimbo Simango is also a student at the University of Zimbabwe and is looking at the minimum number of camera trap pictures that can be used to accurately answer questions about dog behavior. The last student we were able to get to know is Bongo, a dog; he is the painted dog feces finder in training. We spent considerable time helping the students sort and enter data from camera trap photos. From the photos we identified the pack, recorded the time the picture was taken, the number of dogs, recorded activity, and identified individual dogs if possible. Photo 1 is a camera trap photo used in their research. A good portion of their research is done through camera traps and most of the money we were able to donate was spent on purchasing cameras.

When we were not sorting data we participated in some of the construction projects going on at the facility. We helped build housing structures for the students, visiting professionals, and guests. We learned about green building practices and about how people from the local villages earn life-saving income helping construct the facility's eco-friendly buildings. Workers collect resources on site to make concrete, reducing the need for mined materials. The facility's new conservation classroom is constructed to allow the air to flow through the building in a way which acts as its own cooling system. By the end of our trip the students' housing was finished and they began to move out of their tents into a cool concrete house.

Preparing for the field work was an unexpectedly long process. We spent an entire day cleaning and prepping the trucks. Everything got scrubbed and restocked. More sample kits were prepped and supplies for sleeping and cooking were gathered. Additionally, to prepare us to assist with the research, we spent several hours in lessons led by Dr. Rasmussen. Before we left for the bush we had been schooled and tested on programming



Collar: Assembling anti-snare tracking collar. Photo by Marlvern Kamocha Ndhlovu.



Labeling samples: Preparing fecal samples. Photo by Dr. Greg Rasmussen.



Learning: Dr. Greg Rasmussen gives a lesson on the local ecology. Photo by Katie Prinsen.

ranger offer this was special because this meant we were able to leave the roads for some exploring. When the exploring began with him adamantly offering us water from a water hole where animals were visibly lying dead we were wary, not only of the “drinking” water but also about going on foot into the bush. We took the risk and had an amazing and educational experience. He was able to tell us about several carcasses we came across. Most had been killed by lions but one elephant had starved. The elephant carcass had its tusks removed by the rangers to eliminate the chance of poachers taking them. Having the ranger to guide us on this walk was invaluable, the experiences he shared and information he gave us on the ecology and habits of the wildlife was remarkable as he spends two months at a time in solitary, observing the area.

After a week of field work, heavy rainfall left many roads impassable and even going a short distance we would find the vehicles getting stuck in thick mud. As the roads would take days to dry out, we decided to leave the field. As we headed down the only road out of the park, we found the road had become a fast flowing river and so leaving was not an option until the water levels dropped. The rain had also caused the park to be without power, leaving the rangers in the dark. We learned that going without power seemed to be more common than having it.

Our time in the field had come to an end but we had gained a lot of knowledge about painted dog behavior and ecology in addition to learning about many other wildlife species. We also learned a lot about the conservation work PDRT is doing to save and protect painted dogs. This work includes: persuading locals about the importance of the dogs, providing a market for their dog artwork which increases protection of wild dogs, building an off-site conservation school, finding sponsors for students so that they can continue their education and obtain conservation jobs, teaching communities conservation practices that will promote better farming, educating farmers so they no longer see a need to shoot painted dogs, collaborating with the national parks and reserves to promote habitat conservation and restore healthy habitat for dogs, identifying dog populations and causes of mortality, and many other ongoing efforts.

The most well-known project at PDRT is their anti-snare collar project. When

Dr. Rasmussen first began this project the collars were made of a thick belt, 12 rivets, and a large metal plate. Since the first prototype these collars have undergone several improvements. The current collars are now made of two thin belt strips, nine rivets, a smaller metal plate with holes in it, a solar panel, a transmitter, two AA batteries, and a solar charging unit. The solar charging unit was incorporated into the collar while we were there. For any field research, the common goal for tracking collars is for them to weigh a total of 2.5% of the animal's body weight or less. The current collars being produced by PDRT weigh approximately 1% of the dog's body weight.

Aside from the time we spent at PDRT and in the bush, we had the privilege to spend two days in Victoria Falls during which time we met local people and were able to talk with them about painted dogs. The people seemed excited that we were there to support their country's natural resources. Not long ago painted dogs were seen as vermin as people thought that they killed livestock. Painted dogs have only been found to account for 0.17% of livestock losses and most people's livestock die because they are consuming trash (G. Rasmussen, personal communication, December 2016). After years of Dr. Rasmussen's work in the community to change people's minds about this endangered species, we now had the privilege of seeing beautiful artwork around Victoria Falls of the dogs and their puppies. Unfortunately most people in this area live on just a few dollars a day. Going to the local stores, we were shocked to see most things costing as much or more as what we pay for goods in the U.S. Conflict with wildlife undoubtedly occurs when people are unable to support themselves. Wildlife getting caught in snares is a big problem as people try to catch bushmeat which goes for a higher price at the market. As painted dogs are wide ranging, they are too often caught in snares and killed. Even the loss of one pack member can cause a pack of dogs to fail. PDRT works to collect snares and pay artists to turn the snares into marketable artwork.

Our initial goal before we went on this trip was simply to raise any amount of money we could for painted dog conservation. People seemed more willing to donate to our effort knowing that their donations were also going to help us go to Africa and volunteer at the facility for which we were raising funds. Spending time at PDRT we had the chance to learn a lot from Dr.

Rasmussen about conservation and we especially learned a lot about dog behavior, what we could do to improve dog husbandry in captivity, and received advice on dog introductions. Conservation trips like this can help keepers show what zoos are doing to help endangered species in addition to gaining invaluable information that can help us better care for animals in captivity. We share this information with our guests and they can see how their support of the zoo doesn't stop here but benefits species worldwide. Opportunities like this can also benefit other zoo professionals such as educators, managers, landscapers, office personal and maintenance crews. There are a number of volunteer opportunities at PDRT and other facilities to get involved with construction, habitat restoration, education, fundraising, and research. These opportunities can be mutually beneficial for conservation facilities and volunteers of any profession.

Working to achieve our goal would not have been possible without the support of everyone on staff at Rolling Hills Zoo. We received enormous support from many people including: some of our zoos incredible generous donors, our board of directors, our community, and everyone from the executive director to our guest services staff. Our zoo had never before made a contribution of this size. Everyone working together made this effort possible and this has been very beneficial for our organization. We did not think a small zoo in the middle of Kansas could raise a large sum of money to donate to the conservation of one species but if it's possible for us, it's possible for you!

Acknowledgements

Thank you to those who made this trip possible: our generous donors, our board of directors, Robert Jenkins, Kathy Tolbert, Linda Henderson, Debbie Foley, Brenda Gunder, Vickie Musselman, Danelle Okeson, Danita Bosquez, and all of the staff and volunteers at Rolling Hills Zoo. Thank you to Brandon Davis with PDPI for all of your support. Thank you to Dr. Greg Rasmussen, Mary Wasserman, and the staff at PDRT for making our trip memorable. 🌿

ENRICHMENT OPTIONS

COORDINATORS: Stephanie Miner, Akron Zoo • Beth Stark-Posta • Julie Hartell-Denardo, St. Louis Zoo
Beth Ament-Briggs, Briggs Zoological Consultancy

A Big S.P.I.D.E.R. Doesn't Have To Be Scary

Carrie Jung, Lead Animal Care Specialist
Chicago Zoological Society's Brookfield Zoo

Introduction

The S.P.I.D.E.R. model for environmental enrichment is now a widely utilized format for the development and execution of enrichment programs in zoos and aquariums. The S.P.I.D.E.R. acronym stands for Setting goals, Planning, Implementation, Documentation, Evaluation, and Re-adjustment. When our team started using the S.P.I.D.E.R. model we defined the goal of each enrichment device but didn't investigate the bigger picture of what we expected our animals to spend their day doing. In October of 2013 I attended AZA's Managing Animal Enrichment and Training Programs course. During discussion, one of the course instructors raised the question: "If zoos were perfect, how would you expect your animals to spend their day?" This was a light bulb moment

for me and changed my perspective on how to view enrichment. It wasn't just a way to express certain behaviors here and there, but a way to shape the bigger picture of how an animal spends its day.

Methods

In November of 2013, I raised this discussion with the ungulate team at Brookfield Zoo and we committed to work throughout the course of the following year to determine a measurable behavior goal for each species in our area. The first step in our process was to research natural history on each species and find activity budgets on wild animals, whenever they were available. We used this information to create ethograms for each of our species and we began to gather baseline behavior data. We were careful to clearly

Photo 1 Przewalski's horses grazing in a 'pasture' yard. *Photo by Jim Schulz of Chicago Zoological Society.*



define each behavior so it was exclusive of other behaviors. Since we did not have a lot of free time to set aside for observations, we opted to conduct five scans daily on each species for two weeks at a time. We didn't assign times, but just allowed keepers to do the observations when they passed by those animals throughout the day. While this didn't give us truly scientific data, it did give us a good snapshot of what our animals were doing during the day. During this process, we also took advantage of having an intern utilize more structured observation methods on one group of animals. We compared our results of the walk-by scans to the intern's data and found them to be similar.

Once we had a baseline activity budget on our animals, we compared them to activity budgets of wild animals. For most species in our care, we considered the activity budgets of wild animals to be our benchmark and shaped our goals accordingly. We care for mostly ungulates, which spend significant portions of their day foraging. Since foraging takes up so much of their day, most of our behavior goals were set to match the percentage of time that wild animals spend foraging. For example, our behavioral goal for Przewalski's horses was to see them foraging for 40-50% of their day since our research showed that wild or semi-wild Przewalski's horses spend 46% of their day foraging. This helped narrow our focus and allowed us to strive for a goal that was both significant and measurable.

In order to meet our behavioral goals, we needed to restructure our enrichment calendars and make changes to our animal husbandry routines. We decided that instead of rotating equally through our inventory of enrichment devices, it was more beneficial for us to focus more heavily on offering enrichment that helped achieve our behavior goals, which in most cases was increasing foraging time. We also started thinking of enrichment not just as a particular device that is offered, but also as strategies to achieve goals. For example, we included not only feeder devices in the rotation, but things like access to a pasture yard or varying frequency of feedings. We also made some general changes to our husbandry standards, such as: not offering diets in a bowl or pile, but as part of their daily enrichment; ensuring that browsers are getting browse at a minimum of three times per week, but ideally every day; and feeding out afternoon hay rations on exhibit mid-afternoon, not inside barns which they don't have access to until the end of the day.

Date	Time	Forage	Rest	Locomote	Other	Out of View	Total
1 July 2014	830	1					
1 July 2014	1000		1				
1 July 2014	1115	1					
1 July 2014	1300		1				
1 July 2014	1530			1			
	Total	2	2	1			5
		40%	40%	20%	0%	0%	

Table 1: A simplified example of our ethogram and resulting activity budget.



Photo 2 Gerenuk displaying bipedal foraging behavior to access elevated browse. Photo by Jim Schulz of Chicago Zoological Society.

At this time we also converted our enrichment calendars into Excel spreadsheets and started evaluating enrichment daily. We rated enrichment daily according to the following scale: 1 (does not meet intended goal), 2 (partially meets intended goal), or 3 (meets intended goal). Our calendars are broken down into summer and winter rotations since we are in a northern climate and our needs and opportunities change seasonally. At the end of each season, we evaluate our enrichment through the use of Excel pivot charts to get an average rating for each enrichment initiative. Anything that is rated between 2 and 3 is considered successful and is left in the rotation. Anything that is rated between 1 and 2 warrants a discussion about whether it can be improved, or whether it should be removed from the rotation. We also use this discussion time to brainstorm new ideas for enrichment initiatives.

After making changes to the enrichment rotations, we repeated our behavior observation process for each species. Each species was observed quarterly but we staggered them throughout the year so it was more manageable. We met quarterly to discuss whether or not we were meeting our behavioral goals. For species that were not meeting their goal, we discussed changes to their husbandry routines and enrichment rotations to help us work toward our goal. And again, we brainstormed new enrichment initiatives at this time. We kept a running list of changes that were suggested as a reference during future discussions.

Re-adjusting

The S.P.I.D.E.R. model has helped us to re-adjust not only our enrichment to positively influence animal behavior, but also,

Date	Goal	Device	Rating	Keeper	Comments
25 Sept 2014	↑ exploration	hay beds	2	CJ	Offered outside
26 Sept 2014	↑ foraging	feeder toy	3	HMK	PVC log feeder
27 Sept 2014	↑ foraging	pasture yard	3	BS	
28 Sept 2014	↑ foraging	scatter treats	3	NE	carrots

Table 2: An example of the spreadsheet used to record and rate daily enrichment.

our whole behavioral husbandry process. While our observation methods were very keeper friendly, the time needed to input and evaluate all the data has proved difficult. We were fortunate to have a high school mentee that volunteered her time once a month to input data for us when we began this process. She has since moved on to do great things elsewhere so we needed to come up with a new strategy to maintain forward progress. We decided to narrow our study to just four species in our area so we can focus our energy and get more objective data. We used the following criteria to identify our four species: A) Is this a species with which we have consistently failed to achieve the established goal? B) How much impact can we have by focusing on this species? For example, do we have a whole herd or just one individual? And C) Will this species likely be represented at Brookfield Zoo on a long-term basis?

With a more narrowed focus, we have now decided to rely solely on our interns for data collection and evaluation. We hope this will result in more objective data since we can control their observation schedule more easily. This also fulfills the qualifications for the required project as part of our intern program and gives our interns more hands-on experience with behavior management and research. We are excited about the progress we have made so far and look forward to continuing to influence positive changes in our animals' behavioral welfare.

Acknowledgements

I would like to thank Dawn Neptune, Hollie Colahan, and Beth Stark-Posta, as instructors of the MAETP course I attended, for offering the inspiration and tools necessary to move this project forward. I would like to thank the Antelope/31st team and Animal Programs managers at Brookfield Zoo, as well as our past and current interns for supporting and engaging in this process. Special thanks to Erin Shattuck for her many hours of data entry. And lastly thanks to our Enrichment Staff for turning our ideas into tangible enrichment. 🐘

Device	Avg. Rating
pasture yard	2.966666667
hay beds	2.75
PVC log feeder	2.928571429
scatter treats	3

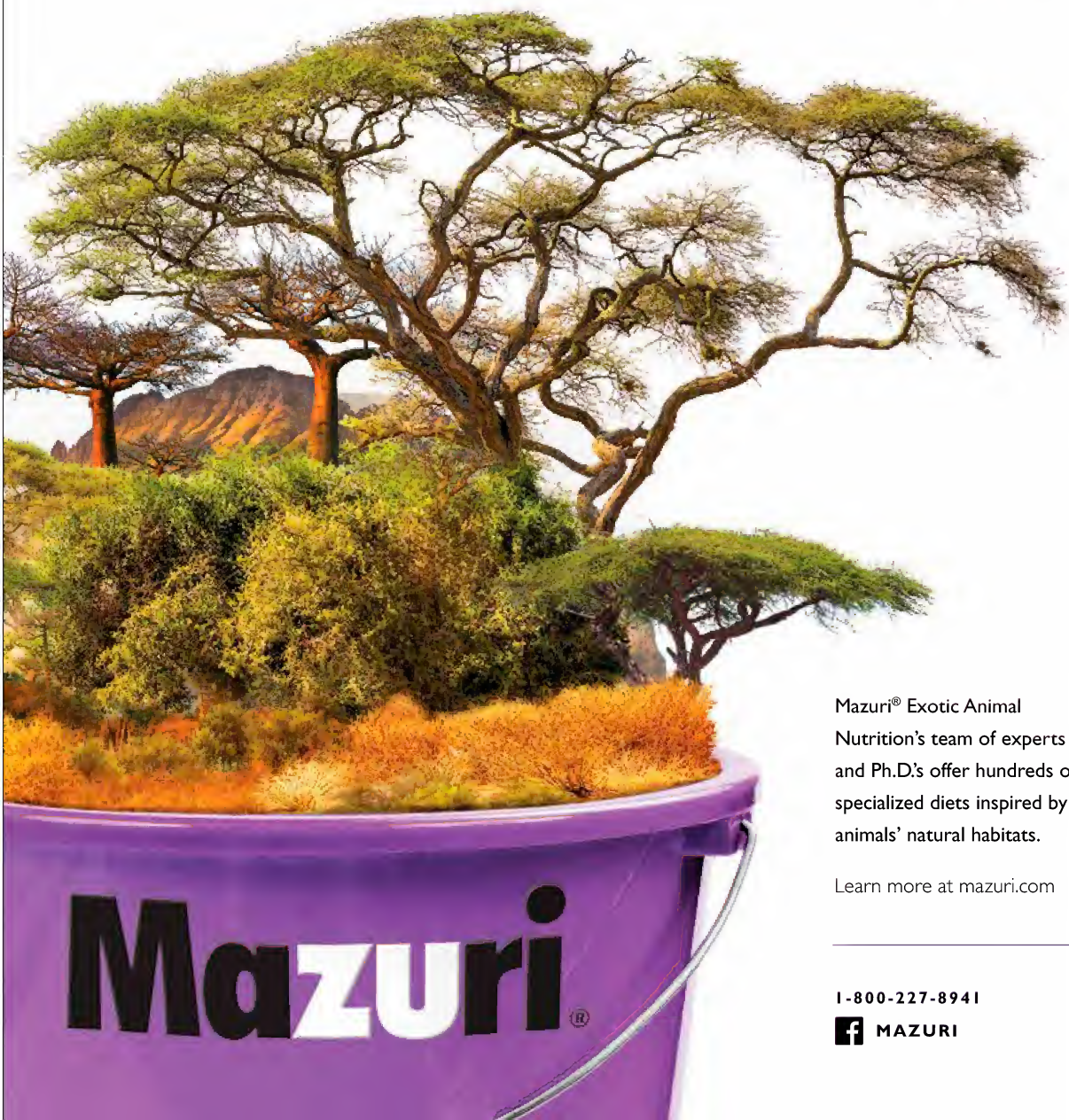
Table 3: An example of the pivot chart used to calculate average enrichment ratings.

Coordinator's Comments:

Great paper Carrie. Thanks for sharing your experience and ideas. A few things that stood out to me are:

- ▶ The value of professional development: Your light bulb moment in AZA's MATEP class changed your perspective, resulted in goal-based enrichment changes that aim to improve animal welfare, prompted changes to husbandry standards that further work to reach goals, created new opportunities for interns to gain important experience, and now by sharing with greater AAZK community could result in more light bulb moments for others which could impact welfare of even more animals. The money, time and resources invested in quality professional development and educational advancements are always well worth it. Great advice for everyone is to save your pennies, write those grant/scholarship applications, and work with your institutions to maximize access to these opportunities.
- ▶ Considering the timeline instead of the snapshot of animal care: Your shift in thought towards enrichment as "a way to shape the bigger picture of how an animal spends their day" is reflective in the zoo community's shift towards animal care as 24/7 consideration. What do animals do after the zoo closes, what opportunities do we leave them with at the end of the day?
- ▶ Goal-driven behavioral husbandry: When the team thinks of "enrichment, not just as a particular device that is offered, but as strategies to achieve goals" the program lexicon shifts from enrichment as a noun to enrichment as a verb. The focus becomes the outcomes of the program and not the items to get there. This allows much better integration of natural history details as well as individual animal needs and personalities resulting in improved welfare outcomes.

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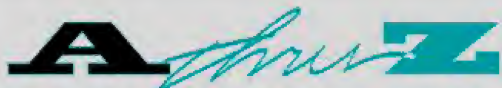
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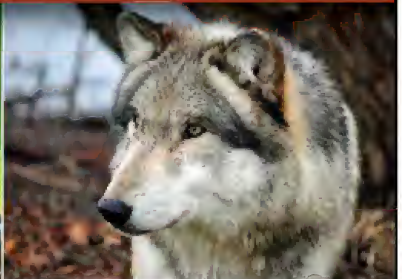
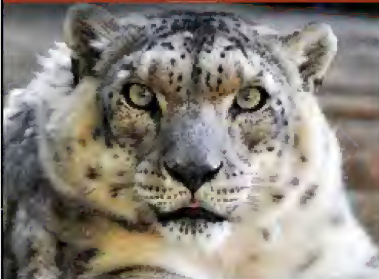


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